

CLAIMS

1. A structured light generator for illuminating a scene comprising a light source arranged to illuminate part of the input face of a light guide, the light guide comprising a tube having substantially reflective sides and being arranged together with projection optics so as to project an array of distinct images of the light source towards the scene.
2. A structured light generator as claimed in claim 1 wherein the light guide comprises a tube having a constant cross section.
3. A structured light generator as claimed in claim 2 wherein the cross section of the tube is a regular polygon.
4. A structured light generator as claimed in claim 3 wherein the tube has a square cross section.
5. A structured light generator as claimed in any preceding claim wherein the cross sectional area of the light guide is in the range 1 to 50mm<sup>2</sup> or 2 to 25mm<sup>2</sup>.
6. A structured light generator as claimed in any preceding claim wherein the light guide comprises a hollow tube having reflective internal surfaces.
7. A structured light generator as claimed in any of claims 1 to 5 wherein the light guide comprises a tube of solid material adapted such that a substantial amount of light incident at an interface between the material of the tube and surrounding material undergoes total internal reflection.
8. A structured light generator as claimed in any preceding claim wherein the light guide is between 10 and 70mm long.
9. A structured light generator as claimed in any preceding claim wherein the projection optics comprises a projection lens.

10. A structured light generator as claimed in claim 9 when dependent upon claim 7 wherein the tube of solid material is shaped at the output face to form the projection lens.
11. A structured light generator as claimed in claim 9 or claim 10 wherein the projection lens is a hemispherical lens.
12. A structured light generator as claimed in claim 11 wherein the centre of the hemispherical lens is located at the centre of the output face of the light guide.
13. A structured light generator as claimed in any preceding claim wherein the array of images projected towards the scene have a common point of origin.
14. A structured light generator as claimed in any preceding claim wherein the projection optics are preferably adapted to provide a substantially focussed image at a first distance and a substantially unfocussed image at a second distance, the first and second distance being within the expected range of operation of the apparatus.
15. A structured light generator as claimed in claim 14 wherein the first distance may be larger than the second distance.
16. A structured light generator as claimed in any preceding claim wherein the light source has a non-circular shape.
17. A structured light generator as claimed in claim 16 wherein the light source has a shape which is not symmetric about the axes of reflection of the light guide.
18. A structured light generator as claimed in any preceding claim comprising more than one light source, each light source arranged to illuminate part of the input face of the light guide.

19. A structured light generator as claimed in claim 18 wherein the light sources are arranged in a regular pattern.
20. A structured light generator as claimed in claim 18 or claim 19 wherein the light sources are arranged such that different arrangements of sources can be used to provide differing spot densities.
21. A structured light generator as claimed in any of claims 18 to 20 wherein at least one light source emits light at a different wavelength to another light source.
22. A structured light generator as claimed in any of claims 18 to 21 wherein at least one light source is shaped differently from another light source.
23. A structured light generator as claimed in any of claims 18 to 23 wherein at least one light source has a shape that is not symmetric about a reflection axis of the light guide.
24. A structured light generator as claimed in any of claims 18 to 23 wherein at least one light source is located within the light guide, at a different depth to another light source.
25. A structured light generator as claimed in any of claims 1 to 19 wherein the light source is arranged to run from one side of the input face to another such that the structured light generator illuminates the scene with an array of lines.
26. A structured light generator as claimed in claim 25 wherein the light source is arranged relative to the light guide so as to illuminate the scene with intersecting lines.
27. A structured light generator as claimed in claim 25 or claim 26 wherein the light source may be adapted so as to be capable of illuminate the light guide so as to produce either an array of lines or an array of separate spots.

28. A structured light generator as claimed in any preceding claim wherein the light source is arranged to illuminate the input face of the light guide through a mask.
29. A structured light generator as claimed in claim 28 wherein the mask has at least one transmissive portion, the or each transmissive portion being arranged to illuminate only part of the input face of the light guide.
30. A structured light generator as claimed in claim 29 wherein the or at least one of transmissive portions of the mask has a non-circular shape.
31. A structured light generator as claimed in claim 30 wherein the mask has a plurality of transmissive portions and at least some of the transmissive portions have different shapes.
32. A structured light generator as claimed in any of claims 28 to 31 wherein the mask has a plurality of transmissive portions and at least some transmissive portions are transmissive at different wavelengths.
33. A structured light generator as claimed in claim 28 wherein has at least one transmissive portion arranged to run from one side of the input face of the light guide to another such that the structured light generator illuminates the scene with an array of lines.
34. A structured light generator as claimed in any of claims 28 to 33 wherein the mask comprises a modulator adapted such that the transmission characteristics of at least part of the mask may be varied.
35. A structured light generator as claimed in any of claims 28 to 34 further comprising a homogeniser disposed between the light source and the mask.
36. A structured light generator as claimed in any preceding claim wherein the generator projects an array of images over an angle of between 50° to 100°.

37. A structured light generator as claimed in any preceding claim wherein the generator has a depth of field of 100mm to infinity.